

# Surat Gas Project

## Community information sessions 23-28 May 2011

### Introduction

In May 2011 Arrow Energy (Arrow) held a series of community information sessions to discuss the Surat Gas Project. Questions and answers from those sessions were captured by JTA Australia and are presented in this document.

The purpose of these meeting notes is to reflect the questions asked and answers provided during the community meetings. The notes are based on a written record of the questions raised and include some paraphrasing and summarising; every effort has been made to preserve the integrity of the discussions. Where the same or a similar question has been asked in other sessions, the most complete answer has been provided.

Questions varied across the seven sessions. To ensure that valuable information is shared throughout the communities of the Surat Basin, these notes summarise questions and answers asked across all sessions.

The Surat Gas Project community information sessions were held from 23 to 28 May 2011 at:

- Wandoan 23 May 2011
- Miles 23 May 2011
- Chinchilla 24 May 2011
- Cecil Plains 25 May 2011
- Dalby 26 May 2011
- Millmerran 27 May 2011
- Goondiwindi 28 May 2011

The proposed project is Arrow's largest gas exploration and development program in the Surat Basin and involves continued exploration in the Basin to identify the most economic and environmentally acceptable areas for future gas production. The areas covered by the project extend from Wandoan to Dalby and south to Millmerran and Goondiwindi where Arrow holds petroleum tenure and environmental approvals for exploration.

As many of you already know, JTA asks for feedback during each of the consultation phases. In response to the information needs expressed by you, phase four of the consultation included Technical Water Sessions in Chinchilla, Cecil Plains and Dalby. The notes from the question and answer sessions at each of those have been included in this document and the presentation by the West Australian water expert is available on the Arrow Energy website at [www.arrowenergy.com.au](http://www.arrowenergy.com.au), by freecall telephone number **1800 038 856** or at [suratgas@arrowenergy.com.au](mailto:suratgas@arrowenergy.com.au).

### How to read these notes

Questions and comments from the audience are in bold type. The unbolded responses are from Arrow staff.

In some cases responses have been summarised. Where one response to a commonly-asked question was more comprehensive at one session than another, the more detailed response has been used in the interests of better understanding. In some cases, additional information is included to provide further context or explanation; this information is in brackets within text, or italicised following the answer.

# Surat Gas Project

## Community information sessions 23-28 May 2011

Arrow will hold another round of information sessions in September or October 2011 to present initial results of the EIS and update technical progress on water management. Arrow will advise of session dates closer to the time. If you have questions or comments about the project or the meeting notes, please contact the project team during working hours on:

**freecall 1800 038 856**

**email: [suratgas@arrowenergy.com.au](mailto:suratgas@arrowenergy.com.au)**

**post: Surat Gas Project, Reply Paid 81 Hamilton QLD 4000**

### **Acronyms**

ATP	Authority to prospect
BSA	Basin Sustainability Alliance
BTEX	benzene, toluene, ethylbenzene, and xylene
CSG	coal seam gas
CNPC	China National Petroleum Corporation
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Resource Management
EA	environmental authority
EIS	environmental impact statement
FID	final investment decision
GRC	Goondiwindi Regional Council
LNG	liquefied natural gas
PL	petroleum lease
QGC	Queensland Gas Company
QWC	Queensland Water Commission
RO	reverse osmosis
TRC	Toowoomba Regional Council
WCM	Walloon Coal Measures

### **Conversions**

1 kilolitre (KL) = 1,000 litres

1 megalitre (ML) = 1,000,000 litres

1 gigalitre (GL) = 1,000,000,000 litres

### **Queensland Government Acts mentioned:**

*Petroleum and Gas (Production and Safety) Act 2004*

*Mineral Resources Act 1989*

*Water Act 2000*

*Water Supply (Safety & Reliability) Act 2008*

**Miles**

Date:	23 May 2011	
Venue:	Leichhardt Centre, Columboola Function Room	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Tony Knight, Vice-President Exploration	Arrow Energy
	Darren Stevenson, Asset General Manager South	Arrow Energy
	Carolyn Collins, Environment Manager	Arrow Energy

**1. You say that Arrow does not frac in the Surat Region. Does it do so in other places, but not the Surat region? Can you give me a list of the chemicals used during this process?**

We have produced a fact sheet on fracking which is available here and there is also a government information sheet on fracking. Although Arrow doesn't frac in the Surat Gas Project area, it does do so in the Bowen Basin as the geology is different. The chemicals used for the process do not include the BTEX chemicals which have received a lot of negative media coverage. The chemicals used by Arrow in the Bowen Basin have various proprietary names although it is best to describe them by their more generic names which are: acetic acid (basis of vinegar), gutaraldehyde (also used to disinfect medical and dental equipment), surfactants (also used in soaps and toothpaste), cellulose (also used in wallpaper paste and paper), bactericides (to inhibit the formation of bacteria that may corrode steel and cement well casing, also used in agricultural treatment of crops), guar gum (from the guar bean; vegetable gum is also used in ice cream and is fed to cattle).

*Note: Regarding the comment that we won't be fracking, we should make clear that this commitment is in regard to the area of the Surat Gas Project. Arrow does hold some tenements in deeper parts of the Basin, which do not form part of the Surat Gas Project area, and for which we don't have any plans to develop in the foreseeable future. However, these areas are so deep that it may be necessary to use fracking in those areas - in the same way that other companies in the Surat Basin frac coals at great depths.*

**2. When you get these chemicals for fracking have they been passed by the chemicals authority in Canberra? Why aren't they approved by the federal government?**

The chemicals we use are authorised by the Queensland Government as it is the state government rather than the federal government which regulates this aspect of the CSG industry. As I said previously, we do not use any of the BTEX chemicals and the chemicals mentioned above do not require assessment under the government's priority assessment scheme as many of them have common uses including in the food and agricultural industries. The chemicals used are quite benign and chemicals used in the United States are not allowed here. I would also like to add that a CSG company would not frac if it doesn't need to as it is a costly exercise.

Arrow is responsible not only for monitoring the level in groundwater aquifers but also ensuring its quality as there are strict monitoring requirements about quality as well.

**3. If Arrow is not fracturing, how do you release the gas?**

Gas is freed by releasing the water from the coal seam which in turn reduces the pressure; you do not always need to fracture the coal. Depending on its permeability (a measure of how easily gas and water flow through the coal) lower permeable coal may need some stimulation (fracturing is one stimulation technique). In the Surat Basin it is highly permeable. Arrow's tenure in the Surat Basin is shallow, i.e. at around 600m, and has relatively high permeability. Some of the CSG companies have coals which go deeper to around 1km. Because of the extra pressure from the additional overburden in those areas, permeability is lower and there may need to be some stimulation to get the gas flowing.

**Comment - You don't seem to list many issues in relation to endangered species. Some 53% of Australia's extinct species are in Queensland. I've been dealing with QGC which generally doesn't use spotter catchers<sup>1</sup> – and the ones they have go through the foliage after it has been knocked down. Also, there is disrespect for the Indigenous people.**

**4. Re settlement dams - what are you going to do with the water?**

Historically Arrow relied on evaporation dams to dispose of water; this was then going back into the environment through evaporation and raining down somewhere else. But there's been a change – the industry has gone from small scale to a scale that was not envisaged at the time - companies now need to process the water and do something beneficial with it. There are a range of beneficial use processes, and as Carolyn outlined some don't need treatment, including feedlots. Arrow is building an array of new dams at Tipton and a reverse osmosis treatment plant. It has bought a farm and has applied for a beneficial use approval from DERM which will set water quality and monitoring conditions to use the water coming from the treatment plant. It is also planning on drilling a well to trial reinjection.

In relation to spotter catchers there is a strict process on site clearing as well as vegetation and fauna management. Ecologists go out to site with land agents and discuss with the landholders what is there prior to clearing. They have to record the particular species and list it in a register. Likewise with cultural heritage, we work closely with Indigenous groups in the area to do those clearances. There is now a project requirement that a spotter catcher is required at the time of clearing.

**Comment - The issue I have with spotter catchers is they are city-based and have no experience with invertebrates. I am now going with QGC to show where and how to find these animals. I want to know why local people can't be used. Once we lose our flora and fauna humans will be next.**

**5. Assuming you test the water, where do you send that test sample? Do you do it yourself, through a university or government?**

The water sample goes to an accredited third party as is required by DERM.

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<sup>1</sup> A spotter catcher is any person holding a current Rehabilitation Permit licensed under the Queensland *Nature Conservation Act 1992*. A spotter catcher will observe the clearing of an area, but also will identify habitat, nest sites and environmental elements which may constitute a threat to the wildlife at the site.

**6. QGC talks about its project going ahead for 45 years and says it will retrieve 2.4 million tonnes of salt. What is your estimated amount (for the life of Arrow's project)?**

Arrow is still at an early stage in water profiling. Our information sheet gives an indication of the proportion of the salt to our water volume. It will be a significant amount. We are working with QGC, Origin and Santos to consider putting a process in place to use it beneficially e.g. in chemical production.

Because we are still in the early stages of the project we don't yet have firm figures for volumes of salt; this means that at this stage we cannot enter into any commercial contracts in regards to the salt. In the absence of that, we need to have an answer for the government on how we will manage the salt in the interim – this includes brine dams, concentration of the salt, and an additional crystallisation process for easier transport to use in other products. As a base case we will remove it from the site and take it to a regulated waste facility. We are committed to removing the salt from the land, and our preference is to use it beneficially.

**7. As the gas companies are operating all over Queensland, why haven't they come out to confirm the Great Artesian Basin will not be affected...or do gas companies consider there is a risk of contamination of the GAB.**

Arrow believes it won't have a significant impact on the GAB, especially in terms of quality. The modelling to date indicates the volumes that we will be drawing as an industry are very small compared to the size of the GAB. When you look at the total volume stored in the GAB, around 8,700,000 GL, our take will be approximately 25 GL per year which is small relative to the capacity of the GAB.

**8. But you still can't say that there isn't a risk that contamination will occur?**

We believe that because of the way we are doing things now, with drilling techniques and early detection systems for leakage and seepage, we won't have an impact on water quality.

**9. 25 gegalitres a year is a lot of water.**

We understand that's a lot of water. That 25 GL isn't out of the aquifers that most people are using. It's out of the Walloon, not out of the Hutton Precipice or Condamine.

**10. One of the issues that impacts on landholders is the question of compensation. That can vary based on the type of land you have. By the same token someone who has 2000 acres of good land in Dalby and someone who has 3000 acres of average land elsewhere, they still make a living from it, so you've got to try to balance that out. One of the things I would like to see is for Arrow and the government to work something out where the landholder feels like they're getting a benefit from it. Part of the problem is that it takes a long time for the issues to be resolved. There is a lot of emotional attachment to the land for landholders, and in my case I wanted to pass my land on to my sons and grandsons, which now won't happen. But this doesn't get valued in the overall consideration of the issue and yet is quite important.**

We understand there are impacts that aren't measurable and we are trying to work out how to best deal with those. We think those impacts are most significant for production wells. With exploration wells there is much less activity, and they are there for a shorter

time. We really welcome the feedback from someone who has been through the process so that we can build up our compensation framework to work for everyone.

- 11. I now have two pipelines owned by other companies running through my property. The previous owner sold his land and got compensation of around \$1500 for that acreage. That land is now worth a lot more as it is close to town. We have had to do most of the maintenance on the pipeline and when the company does it themselves, they bring noxious weeds and seeds and we have to clean up the mess every time. The same company has bought another adjoining property and we're going to have the same problem. The compensation doesn't cover the ongoing maintenance of the lines.**

I am aware of differences in landholder arrangements re transmission pipelines and the infield pipelines which connect gathering systems up. It is usual in the case of transmission pipelines to have an upfront, one-off compensation payment to acquire the rights for the easement. On the upstream side, we recognise there is a much bigger ongoing impact i.e. crews visiting perhaps up to three times a week including workover<sup>2</sup> and maintenance workers. We not only pay an upfront payment but an ongoing one and we also fix up any mess; we take weeds and seeds seriously. We have taken a serious and thorough approach to weed management and washdowns as we move through the country. We also pay a fair bit of money to council to maintain the roads. The petroleum and gas inspectors will be particularly interested if there are problems with well integrity, weeds and seeds management, or maintenance issues.

- 12. Is the weed and seed certification now part of legislation or is this simply an agreement.**

It is now part of the regulatory framework and Arrow is in the process of rolling out its procedures to comply. When we now come onto someone's property we have to present a certificate to say vehicles are pest free and have had the appropriate washdowns. Also if we bring any soils or gravels on site there has to be a certificate from that supplier to say that it has been inspected and cleaned.

- 13. There are some issues with washdown. Now we have a problem with myrtle rust getting into the area from NSW; it is destroying gum trees, and we don't yet know what else it will destroy. It is very difficult to detect the pollen from myrtle rust. Who's going to inspect it and how's it going to be inspected? With respect to washdowns, I feel that it should be in the contract that property owners have the right to inspect all equipment and vehicles and to refuse entry if they feel they are not up to standard.**

The access arrangements are negotiated with every landholder; so whatever is negotiated becomes Arrow's commitment. All operational staff have training to enable them to identify these things and make sure they are not present.

A section in the Land Access Code makes washdown mandatory plus the need to provide the washdown certificate to landholders. Landholders are well within their rights to request them and sight them. Arrow, as part of its commitments, has developed land

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<sup>2</sup> A workover is the re-entry into a completed well for modification or repair and maintenance work.

access rules. There was an incident recently where a contractor tried to get access without meeting these rules and the contractor was terminated.

- 14. From what I gather a lot of the time property owners are not given much notice of entry. How are washdowns going to identify pollen on these vehicles? A certificate means absolutely zilch to landholders; mining companies have a 'don't care' attitude.**

When we want to access a property we ring the landholder up several days before and give notification; there are actually mandatory timeframes for this. We tell the landholder what vehicles will be coming onto the property, when we'll be there and for how long.

- 15. I am unsure whether washdowns happen on approved sites. I observed another company doing it on the side of the road, next to my property. On a longer term basis as wells finish their usefulness, does Arrow remove all of that infrastructure as well as infrastructure that is not so visible? You were talking about 1.5m down – which is not that deep, some farmers put down strainer posts 2m deep. The problem is that there may be a loss of information through change of ownership and loss of memory as the owner ages. Is there a framework that deals with this?**

Yes, there is a regulatory framework. The well has to be plugged and abandoned i.e. cut off at 1.5m underground. The way to make it safe and achieve zonal isolation is to fill it all up with cement and cap it off. The well site is normally 8 x 12m fenced off by cattle panels, except when it is deemed to need something else for security. Everything on the surface is removed. The pipelines are cut off underground, we decommission the pipelines, evacuate the gas and water out of them, but we don't pull them up. They might be useful for pushing water around the farm later on. The pipes are plastic, and will not corrode. With a major facility, we have to return the land to substantially the same condition it was in when we arrived.

**Wandoan**

Date:	23 May 2011	
Venue:	Wandoan Community & Cultural Centre	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Darren Stevenson, Asset General Manager South	Arrow Energy
	Carolyn Collins, Environment Manager	Arrow Energy

**1. You talked about the impact of a three year period for the bores. I believe you won't know what the impact is because sometimes it can take years for an impact to show up.**

What we're trying to do through our modelling process is to see where those impacts will occur, and in what timeframes. That will change depending upon where the activities are, the sequence of development we have across the region, as well as that of our competitors. There is obviously an immediate impact that will occur in the Walloon coal measures. We expect there will be a short term impact. Queensland legislation requires ongoing assessment, and every twelve months we will re-evaluate our data and every three years we need to do another underwater impact report. So even if these impacts do not show up immediately the one in ten years might demonstrate changes.

**2. This offset water is not new water available to rural producers, but it's going to replace water they are already using, is that correct?**

It will only be up to their current allocation. It is meant to provide a replacement for that water so there should be no commercial advantage to receivers of the water. It is only to minimise the impacts in the long term from the CSG industry.

**3. In regards to water security you talked about immediate impact areas. Some are not going to be felt until 2065, after Arrow has surrendered its Environmental Authority. What conditions will apply to Arrow in the future after that?**

The changes to the *Water Act* mean that even after we surrender tenure our obligation in terms of water continues. The whole framework requiring monitoring, reporting and continuing our water bore monitoring program remains and any 'make good' obligations will continue in perpetuity – for quality and quantity.

**4. DERM says 'make good' agreements will be whatever we agree with the resource company. If we agree on ten years are you saying I have security in perpetuity?**

In the agreement you agree measures to be taken should an impact occur and the process you need to go through to implement those measures. Obviously there would have to be an investigation to understand the causes and to confirm that it was Arrow, or one of our competitors, who caused the impact, and then the most appropriate measure identified in that agreement will be implemented. There are a whole range of provisions to deal with the situation where either party can't comply with what's in the agreement; i.e. if there's new technology and there are changes to impact areas then the agreement needs to be amended.

**5. If Arrow is on my neighbour's property but not mine and yet my bore has reduced capacity what are your assurances then?**

Each company's obligation extends beyond its tenure boundary. Arrow is required to monitor and enter 'make good' agreements to the extent that it could have an impact. The

Queensland Water Commission (QWC) through its underground water impact reports has declared some cumulative management areas. Each of those areas will have a designated company which QWC appoints as responsible for any impacts in that area.

**6. You talked about the salt content; there's only so much you can sell, what other disposal means do you have?**

The actual volumes of salt Arrow will have are not enough for one company to enter into a commercial arrangement on its own. We'd have to cooperate with the others. There is a big market for that salt. Because it's early in our project and we haven't undertaken a final investment decision (FID) to proceed with the project, we are yet to finalise estimates on the quantity of salt that we will produce. This makes it impossible to enter into a commercial contract for the salt at this stage, but in the interim we are committed to taking the salt away from the area to a regulated landfill, and then working it into a beneficial use in the future.

**7. Suppose nothing ends up well. Suppose the bores dry up and the gas runs out and Arrow goes insolvent, what will happen then?**

Our business is producing gas. If we end up producing large volumes of water for long periods of time, it's not commercially viable for us to operate a gas business. So if it comes to that we will have to re-evaluate our business.

Arrow is owned by Royal Dutch Shell and PetroChina. To give you some idea of the scale of those companies PetroChina has 1.6 million employees and Royal Dutch Shell has about 110,000 employees – they can afford to put up the needed collateral for the long term. In doing the interim study on the Condamine Alluvium Arrow is not saying 'that is what is going to happen'. There will always be uncertainty, so you test those uncertainties for a range of impacts and probable bad outcomes, particularly groundwater impacts. We need to know what a probable bad outcome will be and the mitigation measures required, all this needs to be built into the plan otherwise we can't take an investment decision.

**Chinchilla Technical Water Session**

Date:	24 May 2011	
Venue:	Bulldog Park	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Dr Lloyd Townley, Director	NTEC Environmental Technology
	Carolyn Collins, Environment Manager	Arrow Energy
Other speakers:	St John Herbert	Arrow Energy

- 1. I attended the Healthy Headwaters meeting a few weeks ago and it became clear that there was totally inadequate information to make high level reliable estimates with much confidence. How accurately can the interconnectivity between aquifers be measured?**

In general, people who work in these areas can answer those questions if all the correct data can be provided. This is why we carry out monitoring programs to enable us to develop our models. The more information we have, the more accurate our models will be.

- 2. Your interest is getting gas from the coal seams. So the coal seams have connected fractures to allow water to move through?**

Yes, there are small cracks, or cleats, in the coal seams. We pump out the water to remove the pressure, which in turn releases the gas from the face of the coal.

- 3. So water in coal seams is not connected to other underground water systems? And you don't need to break up the rock to remove the gas and water?**

We want to take as little water as possible. If we have to remove too much water to get the gas out the exercise will not be commercially viable for us. In the Surat Basin, due to the high permeability of the coals, we do not need to frac.

- 4. So your process of extraction does not move water from the coal seam into other areas of the water table?**

Our modelling will allow us to check this. We will collect as much information as possible from our monitoring programs, and the more we can collect the more accurate our models will be.

- 5. Can BTEX chemicals (benzene, toluene etc.) from coal get into fresh water systems?**

These chemicals can naturally occur in coal, but at very low levels. The industry has been gathering a lot of information about this, and it believes this will not be a big problem.

**Chinchilla Community Information Session**

Date:	24 May 2011	
Venue:	Bulldog Park	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Tony Knight, Vice-President Exploration	Arrow Energy
	Darren Stevenson, Asset General Manager South	Arrow Energy
	Carolyn Collins, Environment Manager	Arrow Energy

**1. In regards to the proposed Hopeland pilot what is the GPS position and whose property is it on?**

We don't have the information here right now. It's in the conceptual stage rather than at agreement. Arrow is currently negotiating with that landholder to determine the location so we cannot discuss it at this stage.

**2. In regard to the Daandine gas release incident, according to media reports a large volume of salt water was released onto the land. What will you be doing to fix and/or rehabilitate that area?**

The water coming out of that is not much different to that coming from landholder water bores. We don't think there will be much of an impact. However, that said part of our follow up activities is to conduct an investigation into all issues, to monitor and assess and rehabilitate if required.

We've had some very small spills before. We work with DERM, the soils are remediated. It's not a new issue, and we have the necessary expertise. We've taken some samples from yesterday's well incident and indications are the soil and water are of good quality.

**3. The well that blew up, was it new or old?**

It was drilled in November 2009. It was drilled and capped and left for 18 months. Not old, but not new either.

**4. I have a long term interest in the CSG industry and I can be described as a chronic critic. I have questions on the beneficial use of salt and water. You made mention about the beneficial two million tonnes a year from production. I spoke to an Arrow staff member and was told that a commercial use arrangement was just around the corner. How are you going to transport it? Can you explain how you're going to transport this massive amount of salt to a chemical processing facility for beneficial use?**

Nothing is going to happen in the short term. There's still some time until we can get a commercial agreement in place as we don't have a clear idea of the volumes that will be produced. In terms of transporting the salt, it may be that we pipe a brine stream or we crystallise it and send it by truck. Our environmental impact studies are assessing the impact on roads from its transport and we will look at all these issues as part of that.

**5. In regards to the beneficial use of water, my concerns are about reverse osmosis water, 'hungry' water. You just can't use it as water for irrigation, it has to be remineralised and tailored to irrigate this particular soil type. In my view this will take a lot of technical expertise and liaison with farmers; how are you going to sustainably use this RO water in Queensland with its widespread irrigation**

**systems to meet your vision? Does that mean farmers will use less Condamine water? Can you do that?**

We agree that water coming from RO is pure water; it removes pretty much every mineral. There is a lot of knowledge about water management, it's not a new thing and there's a lot of information worldwide. Farmers already need to balance their water resources for their soil type. It's not new for them so we don't see it as a big issue. We will adjust the water to meet a particular quality; if we don't meet specifications, we can't send it anywhere so if it is for irrigation it will need to meet a certain quality. The Queensland Government is still working on its approval conditions. There needs to be some discussion between DERM and farmers on what it should be. If we find a more suitable end use for the water then we might explore using that as well.

**6. What's the cost? It must be a lot of money.**

It does cost money. We don't want to drain aquifers; we don't want to take out any more water than necessary to get the gas out of the ground. So we need to manage the water. Our intention is not to make money out of this; it's for the benefit of the Basin and about sustainability, and not about those who get the money at the end of it. We do not want people to be out of pocket as a result of substituting the allocations with this alternate supply. We want to balance all these objectives.

**7. You're saying that you expect the water table level to drop by one to four metres by 2065. If you're dropping by this much what's it going to do to the creeks and rivers?**

The predicted impact of one to four metres is on the far west side of the Condamine Alluvium. This is a pretty conservative model which does not factor in recharge events. This prediction is based on what might occur if we did nothing to mitigate the effects. Our next step is to look in more detail at potential impacts on rivers and creeks, and also to fully investigate all mitigation measures.

**8. After going through RO, waste water is still polluted water. Our native frogs won't be able to live in it, but mosquitoes will be able to breed and this will spread Ross River fever. Have you looked into this, how will you manage it?**

In terms of looking into mosquitoes, no we haven't at this stage. If the RO water was to go into the creeks we have the same adjustments to make as we would for irrigation. There have to be certain minerals in place before that water can be discharged. We couldn't release pure water, there are regulations in place.

**9. I understand you have undertaken a study on bacteria in the aquifers. Could we please have some information on it?**

There are water characterisation tests which incorporate an assessment of the levels of particular bacteria within the water; we should have more information in October at our next consultation meetings.

**10. It's good to hear Arrow won't be doing any fracking in the Surat basin. With respect to re-injection, DERM started trials in re-injection and it was evident how difficult the proposition was to find a site in which to contain water with high salt levels. Is my interpretation correct?**

I agree that re-injection is a highly specialised field. There are limited areas into which you can inject, the chemistry needs to be aligned and you must ensure it's done properly.

Arrow is not taking reinjection as its first option. Beneficial use is a much better outcome. DERM is revisiting its policy on reinjection as we speak, and I believe it will strengthen its requirements. We are talking to DERM about our substitution of allocations program which we believe to be equivalent to reinjection.

There is a reinjection trial in our program for this year. We recently finished drilling the well and will take samples from across the different geological zones and layers. Later, this will allow us to install an injection string to reinject if everything lines up. We have to see if there are suitable aquifers for treated water, looking at the rock mechanics and water chemistry. We also need to determine the number of reinjection wells for every production well.

Regarding the comment that we won't be fracing, we should make clear that this commitment is in regard to the area of the Surat Gas Project. We do hold some tenements in deeper parts of the Basin, which do not form part of the Surat Gas Project area, and for which we don't have any plans to develop in the foreseeable future. However, these areas are so deep that it may be necessary to use fracing in those areas - in the same way that other companies in the Surat Basin frac coals at great depths.

**11. Shell and PetroChina have billions of dollars, why don't you just buy all the properties and save yourself the hassle?**

The majority of landholders don't want this. That's a pretty big level of disturbance. Some have wanted us to buy their land, and we have done so in some cases.

**12. Regarding spacing between wells. I have a cotton field which is 2-3km long. If you say you're going to install a well every 800m, am I going to have 3 or 4 wells on my property? And are there going to be gravel roads on it as well?**

If you just overlaid a grid over that 2km property, it would look like that. We know, however, that it can't work like that. We know we can't put a well on a square grid for every 800m; we have to fit around farming activities. For a mixed use farm, we have used a grid and we have adjusted the distance of the wells, and where the pipes and tracks go.

Our methodology for gravel roads is to build these to access our compressor stations and water treatment plants. We do not generally build gravel roads between wells and access points; instead we'll try to use the tracks that are already on the farm. Gravel can affect the flow conditions of water across the land, and one of the requirements of our environmental approval is not to affect those things.

**13. What if something went wrong during a flood? How would you get in to check your wells?**

We'd walk in, use our all-terrain vehicles or go in with a helicopter. In Daandine during the January floods all the roads around it were cut off. We were taking guys in by helicopter to look at wells.

**14. Do you issue washdown certificates now?**

There is now a new government requirement to do this. Arrow is implementing a new standard for vehicles, as well as fuels and other carriage items.

**15. Is there a washdown facility here in town?**

Yes. We were recently approached to participate in funding to improve the facility in this area. We haven't yet worked out a plan. If you think about the movement between properties, the long distances and varying flora, there's going to have to be some serious infrastructure to properly manage this, and more often than every 100km.

**Comment - There is one at the old sale yards in Chinchilla. QGC uses it.**

- 16. I recently heard of a case of a pig pushing through a fence, damaging the well and creating a leak, with the owner advised to stay indoors for three days. How often are you going to check your wells? When soil is waterlogged cattle and pigs will push through. If you have 2000 wells, in wet weather are you going to be checking all of them? You're going to have to prop those fences up.**

Unfortunately, these stories get a life of their own. In that instance this scenario of a feral animal was one of our theories of what potentially could have happened. The landholder was not required to stay inside for three days. We have made substantial changes to fencing specifications; one is an eight foot high wire mesh fence and the other a cattle panel. The wire mesh fence addresses the potential risk of stock and other animal entrance.

Our standard procedure is to visit a well two to three times a week. We do that because the monitoring systems are manual-based. We are looking into remote monitoring which would extend the period of time between checks. Our checks include looking for gas leaks and doing well integrity checks.

Our fences are designed not to fall over. If there is a gas leak identified remotely, we will check that, and also the ones we inspect as we go past to get to another site.

- 17. Can you guarantee that you will shut the gates and maintain the roads?**

Yes we have developed a set of Land Access Rules which (like our Life Saving (safety) rules) if breached may result in disciplinary action, and even termination of employment. We have found that this policy works. Leaving gates etc. as you found them is one of those rules.

- 18. How often will you be maintaining the roads when accessing private properties?**

Arrow recognises it is a significant road user so it contributes to the council for road maintenance. Under the *Petroleum and Gas (Production & Safety) Act*, Arrow is required to enter into an arrangement with council for the upkeep of the roads it uses.

Arrow fixes up any problems it causes on farms.

- 19. In regards to reverse osmosis processed water, do you know how much it's going to cost?**

Yes we do, it's going to cost a lot more than what you pay for water now. You wouldn't buy it if we sold it for a profit. However, we do have to treat the water if we want to carry on with this business. We will not be making a profit from this water.

**Cecil Plains Technical Water Session**

Date:	25 May 2011	
Venue:	Cecil Plains Hall	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Dr Lloyd Townley, Director	NTEC Environmental Technology
	Carolyn Collins, Environment Manager	Arrow Energy

- 1. I am given to understand from your presentation that changing head in confined aquifers gives a lot less water. The CSG industry will extract tens of thousands of litres of water; won't this have a drastic effect?**

Yes that's true. I don't know exactly what is projected for the whole industry, but everything is relative, depending on impacts, recharge etc.

If Arrow's daily take is 75 ML it is looking at 25.5 GL per annum. Is that able to be mitigated? We need to carry out further tests to understand what could happen if we do nothing.

- 2. Why do you need to substitute if you are not impacting the Condamine Alluvium?**

We've had quite detailed discussions with a whole range of people such as the Basin Sustainability Alliance who have asked for this in its blueprint as well as other irrigators. Because the Condamine Alluvium is already quite depleted this is something we believe we can do to help Arrow and the agricultural industry be sustainable.

- 3. How do you propose to 'make good' in 2065?**

It is important to note that the numbers we have here are cumulative numbers for the whole industry, and they don't reflect any mitigation measures. So, if we do nothing but take water from the region that is what we might be expecting. What we intend to do next is to look at possible mitigation methods and to study what must be done to mitigate those impacts. We are quite happy to work with the irrigation community to make sure there will be a good outcome.

- 4. Landholders and townships rely upon Artesian, Sub-Artesian and alluvial water. I understand that the artesian is connected all the way through the GAB. There must be some sort of connectivity between these aquifers. They are capping all the artesian bores, and the discharge from other bores has increased. We don't appear to have correct figures for what you will extract, but surely taking these quantities out will have an effect? This is an Australia-wide water supply – surely this will affect someone.**

We've explained what our plans are. We're doing a lot of work to understand interconnectivity. We're trying to be proactive in terms of understanding these issues. We are committed to putting a lot of resources in to understand this issue.

- 5. When you showed the diagram with two layers of water you showed water going up through the aquitard into the unconfined aquifer. When you dewater the confined aquifer won't the water go back down?**

You are correct – all underground waters are connected to some extent. What matters is to what extent they are connected. What really matters is the structural geology of the

region and the properties of materials in different layers, the impacts that nature has as well as the impacts we all have...whether it be pumping water for farming purposes, municipal purposes, or in the case of a project like this one. All activities have an impact on how the system works. Hydrogeologists use all the available information to construct the models that now have hundreds of thousands of cells, and use the information the best they can to give them confidence that their predictions are correct.

Carolyn indicated I am one of several people reviewing Arrow's modelling results. She also indicated that the first results have only just come through so I'm not prepared to comment on those; I haven't yet given Arrow my comments. In terms of direction, if you depressurise a system at depth it will change the system and may cause flows in another direction. The likelihood is for the water to come from above and flow downwards to make up for that drop in pressure. However, the permeability, the hydraulic conductivity of the layers in between, can be extremely small and the timescale over which the recovery takes place can be extremely long. In that same long period there can be recharge processes at the surface.

**6. We want 'make good' provisions to be agreed upon between Arrow, the government and landholders. At this stage the landholders are only a speed bump in the process.**

A 'make good' agreement is only between Arrow and the landholder, the owner of the bore potentially affected. Arrow is trying, outside the make good agreement, to determine mitigation measures. It is initiating a process to engage in discussions about how we do that. This will involve a lot of steps, including making sure our views are aligned. Arrow is also engaging with government to determine whether its policies fit with government policy. Arrow will also have to determine the appropriate irrigator group and engage with it.

**7. In relation to the areas of Arrow tenure on the map...how long will you be carrying out activities there? Will it be beyond 2065?**

That is something we will be talking about this afternoon.

I think what you are getting at is the issue of our long-term liability? Under both the Water and Petroleum Acts we are liable for any impacts we have within and outside our tenure areas in perpetuity. So once our tenure is either cancelled or surrendered at the end of the project life we still have obligations in regards to 'make good' and ongoing monitoring until the government is satisfied there is no longer going to be an impact.

**8. What if Arrow folds? Will Shell and PetroChina be liable if Arrow ceases to exist?**

Shell and PetroChina are very large companies. At this stage Arrow has not taken the final investment decision as to whether it will go ahead with the Surat Gas Project. It has a lot of work to do before it gets to that point. The EIS is not yet complete; it will examine a whole range of issues. Once it has been completed and submitted to the government there will be numerous approvals required before we can commence. Shell and PetroChina take all these issues very seriously and they will not decide to undertake this project if they think there is a significant risk that Arrow cannot make good.

**9. With regards to groundwater substitution, practically speaking how will this work? Will you be piping water to landholders' farms?**

As I said previously we are in the early stages of that. We are working closely with key people representing the irrigators group to work out how that is best done. So if you have anything you'd like to add to that we should talk out of session.

**Comment - Lloyd, I feel you need to know that Arrow has been commercially active in this area for about five years. As I understand it, you have been asked to peer review Arrow's groundwater model. The government's legislation suggests that the groundwater model and baseline data has to be collected and submitted prior to commercial activity commencing. This has not yet been done; therefore there is a great deal of concern here about the lack of compliance with government regulations.**

**This is the first time we've seen a model and the first time that a potential impact on the Condamine Alluvium has been publicised. You've probably heard here this morning that we do rely heavily on the alluvium and are taking cuts to existing allocations to preserve it. I would also have concerns about the model that has been presented in the sense that Arrow has suggested that in the next 12 months it is drilling a number of observation holes – 50-100?**

- 10. I would question what holes were used to make the model? Are the holes going in after the model has been made? This doesn't really seem to add up to us as lay-people.**

The visualisation we have prepared shows the boreholes used to support the model. Today is about communicating that information. Arrow is a couple of years behind the other proponents in this industry and is not planning to go ahead with the project until around 2013. So it does have more time than other companies to understand these processes. If you have a chat with the guys from the water team who are here they will be able to show you where those bores are. Some of those are DERM bores, some are Arrow's. We also had a bore inventory done a couple of years ago, and some of the information came from that.

Arrow is compliant with the current legislation in terms of underground water impact reports, modelling and bore assessments; the requirement is to submit one after the EIS. Arrow has 14 months to submit its reports but the work will be done before then. Information is coming together and Arrow now has a lot more understanding than previously.

Once the model has been peer reviewed more information will be available; Arrow will be holding a detailed session in September/October to explain the results of the modelling.

- 11. What is the difference in terms of your obligations between currently producing areas and new areas?**

Arrow has certain obligations when tenure is granted. The timing of these obligations begins from the start date of that tenure. It must meet these obligations before it undertakes any petroleum activities.

- 12. There have been significant periods of time when Arrow has not been compliant with production regulations.**

Yes, we have said previously that under the old regime government did not have all the processes in place to deal with issues, and to deal with all the information provided.

Things have moved on, and government has now put in place processes to make sure there is a real focus on this, both within industry and by the public because of the consultation processes involved. Government has also resourced itself now to deal with this appropriately. Additionally, by using the Queensland Water Commission everyone can be better informed to make appropriate decisions in the future.

**13. Some landholders have begun to undertake their own baseline bore assessments as an 'insurance policy'. What guidelines would have to be in place for Arrow to take on board some of this data for its management plans or make good arrangements? Is there an Australian Standard at which baseline data should be collected?**

The government is currently developing a guideline which has been through quite a few iterations in the last six months or so. It will set out what is required in the baseline assessments. These requirements will probably include certain information to be collected by the company with the bore owner present. It will feed into Arrow's modelling program as well as the government's policies. Arrow is happy to take on board information already collected by landholders.

**14. What guidelines are you currently using for baseline bore assessments?**

We have been in discussions with the government while it's been working out what standards to develop and impose. We've also talked to the other CSG companies to ascertain the minimum level of information that is being collected. Origin has possibly done the most work in that area. I believe what we've been collecting should satisfy the requirements under the new guidelines, but if they don't then we will obviously have to collect some more information.

**15. My home was built in the early 60's and since then my bore has produced good water. In terms of your make good provisions, if the water stops due to your drilling, the water table falls, and you put another bore down to make good, what if that water is not of the same quality? That will be no good to me. Can you assure us that the water will not be poorer quality?**

There are a whole lot of requirements around the make good system, and a lot of options to allow for individual cases and uses. A new bore or deepening a bore is only one option. The obligation we have to make good is to provide you with the same or better quality water. There are several arrangements that can be entered into such as alternative supplies or monetary or non-monetary compensation. The way this is being approached is to use an early detection system through our monitoring and modelling programs so that we understand what is happening to the groundwater systems and what those impacts could possibly be.

**16. Was any water lost from water dams or evaporation ponds during the floods?**

We did have a small approved discharge from our treated water dam at Daandine. That was mainly due to the Wilkie Creek mine being flooded, so it wasn't taking any water from us. There was no discharge from untreated water dams. We are currently building some more treatment facilities. We are required every year to make sure we have sufficient dam storage allowance to get through the wet season. If we don't then we have to have an approved plan for what we will do. In this case we did have approval for the discharge of treated water, and the discharge was strictly monitored.

**Cecil Plains Community Information Session**

Date:	25 May 2011	
Venue:	Cecil Plains Hall	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Tony Knight, Vice-President Exploration	Arrow Energy
	Darren Stevenson, Asset General Manager South	Arrow Energy
	Carolyn Collins, Environment Manager	Arrow Energy

- 1. You said in your presentation that your aim was to have a zero impact on the water balance in the region. Does this mean that Arrow, unlike QGC, won't be applying for a licence to discharge into the Condamine River?**

What we want to do is have the framework for substituting allocations up and running. We will be seeking an approval for discharge but the only reason for this is in case there is some way that water supply is interrupted or if there was such unseasonal wet weather for several years in a row that water supply is unable to be used and there is a backup to maintain the integrity of our dams. If the dams reach a critical level, which may affect their integrity, we would only discharge treated water if it can't be used or supplied in any other way. We would discharge only the bare minimum required to maintain the integrity of our dams. This is not our preference.

- 2. Darren, in regards to your changed arrangements to do with compensation, the last time you guys were here the question was asked in these terms: will this be a business proposition for landholders? Unless I am mistaken the answer was at that time that you are in the business to make money for Arrow, and will only compensate for effects. Is this a turnaround from that? Will this be a business proposition for landholders? Because of the unknowns of this process as the industry progresses we both learn new things. It would be impossible to negotiate upfront a compensation arrangement which compensates for effect. There has to be some incentive and there has to be a business proposition. Is this the case?**

Firstly, is it different from six months ago? Yes. We have understood the message that if we simply compensate for just the easily measurable impacts then that does not meet all the impacts. As to whether it's a business proposition for you, I don't know that yet because we're not far enough along in the process. What we ask of you now is to send through to us what added value looks like to you. What percentage of your farming revenue are you looking for? Obviously if you say 100% then the answer will be no. But we need this information. So the answer to your question is yes, we have listened and taken on board what you are saying, but we're so early in the process that I can't make a commitment as to what it will look like.

- 3. We always hear about how good your Shell and PetroChina are – how big they are. But they still want to hide behind the government's compulsory land access legislation, and the ability to use the Land Court. I think it would make it a better business proposition if you were willing to step out from behind that legislation.**

Voluntary access and agreements is our preference. With every landholder we would like to have a negotiated outcome. There have been instances where, for a range of different reasons, those negotiations have failed, and Arrow has ended up in the Land Court. We will not say that we commit to never going to the land court because a range of things can

happen that are outside our control. But we absolutely understand that we cannot have a 20 year relationship with someone that starts in such an adversarial way.

- 4. The make good provision for the water seems to be satisfactory for us in the early stages. But when you reach the stage that your wells stop producing and the Walloon coal measures are dewatered we need an assurance as to what your long term make good provisions are. We have had discussions with you regarding Brisbane grey water which is an alternative and we believe it should be brought forward as quickly as possible, not left in the background as a backup. It needs to be included in your negotiations with farmers now.**

What we've considered is the extent to which we will supply that water e.g. we're not sure when that water will cease to be available. We anticipate that when that time arrives, we would have been providing that water to existing users. This will allow for a natural recharge in the relevant aquifers. By doing it early on and not leaving it until an impact does occur we hope that this will mitigate any impacts. In the interim we need to run these mitigation scenarios through our model before we come back here to see you again. We have put a lot of work into understanding these issues. We commit that we will make good, which may include a number of potential methods. We have taken the information you have already provided us with back to the project team, and that is being looked at. What we want to do is work out what will provide the best outcome in the long term.

- 5. I'm a landholder in ATP683. In Schedule A of the Environmental Authority (EA) for ATP683 it describes an operational plan which is to be submitted to DERM within 60 business days after issue of the EA. It states the plan must include a description of proposed infrastructure that will be developed within the term of the plan, maps that record the locations of the infrastructure, regulated dams, wells, transmission pipelines, gas processing facilities and water treatment facilities. For each disturbed site there must be a description of the rehabilitation activities to be performed. Will you provide me and any other landholder who is interested with copies of this plan?**

At the moment there is a legal action regarding ATP683 and the Environmental Authority. This means it is inappropriate to provide that plan at the moment while the matter is before a court. As a company we are willing to discuss and talk through this plan; however our ability to do so is constrained while this court action is in train.

On that list you mentioned things like infrastructure and compressor stations. However, remember that it's an exploration tenure; it won't have compressor stations on the land because they are not authorised activities. So if you want to obtain the plan to understand our development intentions it will not be in that plan as it will only be written for the exploration phase, not long term.

- 6. As soon as the legal matter is concluded, will you provide the plan? When will the legal action be concluded?**

Yes we will but at this stage we have no idea when the court case will be finished.

- 7. You made mention that your salt management would include regulated disposal areas. How do you propose to manage the rapidly mounding salt at the Grassdale field? Will that be moved offsite to a regulated area?**

Arrow currently has a project underway to upgrade the facilities at Tipton, including a reverse osmosis plant. There are also some new dams associated with that which will be used in the interim to manage the brine in the area.

**8. Are the unlined ponds at Tipton going to be remediated?**

Those dams were commissioned as evaporation dams and they will be converted to aggregation dams. This means we are not allowed to evaporate in them, they are only to be used for the relatively short-term storage of peaks and troughs in field production. At the end of their life they will be remediated.

In terms of managing the salt on the site, we are building a new lined dam, with a double liner with the leak detection and physical protection under the liners. That work is ongoing at the moment. We will treat the salt from that as part of the wider project.

**9. Will you have a company policy to stop aggregation dams from evaporating?**

All dams will have some evaporation; it is in the nature of a dam, but our intention is for as much water as possible to flow through the system for beneficial use.

**Comment - That compounding salt is the biggest blight on our local community visually. Even if you convert that to an aggregation dam you will still have sideways and vertical movement of those salts because the salts will be above the natural ground level.**

**10. I feel that this industry is very good at isolating individual growers. In regards to the alluvial component of ATP683 land use from a farming perspective, water, household and domestic use is almost identical across almost the entire acreage of your tenure. This company has to get serious with area-wide management and monitoring of the water situation. If you are forecasting a peak impact in 2065 I strongly suggest that a 2km limit on monitoring around your existing setup is completely inappropriate.**

I may not have said it clearly enough, but our water monitoring program will be quite extensive over that entire area and will also include areas outside our tenure. Our immediate priority is those areas we're currently producing from. We're installing those bores and moving outwards from those areas into new areas. This is something we are committed to. It is the only way we can collect enough information to improve our modelling and understanding of the situation.

**11. So at this stage you don't know if specific techniques will be for groundwater substitution, is this correct?**

Most stakeholders appear to think that this is a good offset strategy. Next step is to work with key people in the areas where that might be implemented to sort out the details of how it might happen. That includes working with government to ensure that the appropriate approvals are in place although the agreement would be between the actual people who would be using the substitution, and Arrow.

**12. Are you aware there have been changes to the beneficial use guidelines over the last six to twelve months?**

Absolutely. We've been very involved in trying to do some pre-work in terms of understanding what that would mean for our proposal here. The guidelines have been developed enormously, especially in the last six months. DERM is looking at those issues

now, and is looking to refine the process even further. This is something we need to be involved with. We have to make sure we understand all the requirements and understand the needs of the end users, and that the two are aligned.

**13. My understanding of the current guidelines is that CSG-produced water can't be used for irrigation. So is DERM in the process of changing those guidelines to help you dispose of CSG-produced water?**

That guideline is for a general beneficial use approval. DERM's intention was that it would apply to low risk activities. There is a whole separate framework for specific approvals, such as the irrigation of treated CSG water. That is a very involved process, and that's one that we are going through now. We're looking at one now that we've been talking about to DERM for a year or more. The requirements for an application under that are far greater and the conditions that come at the other end of that are extremely restrictive. The one you are referring to is quite general. Yes it does prohibit those things, but under a general beneficial use approval.

**14. The water for this substitution is coming out of the Walloon Coal Measures, but it won't be substituted back to users in the Coal Measures because there won't be enough of them for the volume you will be producing. So I assume that you will be substituting that water to licensed groundwater users of the Condamine Alluvium in light of the fact that you are forecasting that there will be some impacts. Is that true?**

As we showed on the slide before, we intend to substitute existing allocations from the Condamine Alluvium.

**15. So is Arrow Energy currently in discussions with DERM to somehow freeze our current entitlements, to make way for you to take your water? The map that you showed indicated up to four metres take assuming that you do nothing, but I don't know if it allowed for the assumption that we are already taking groundwater. In your presentation you said that in order to allow the Condamine Alluvium levels to recharge from natural infiltration from rainfall, you were going to substitute the water for us. I assume that in the meantime we won't be taking the water that we have an allocation for, and will be taking this substitution water instead. That's the only way I can see that will allow the water levels in the Condamine Alluvium to increase past where they are now. The landholders themselves are attempting to make that system environmentally sustainable for the long term but once the substitution water comes to an end, and we go back to using groundwater, there will be no way to tell whether the drawdown is due to our use or is a lasting impact from the CSG activities.**

In that time there will still be ongoing monitoring undertaken so the movement of water can certainly be monitored through that process by DERM, by Arrow and by you.

In terms of your question re if we are working with DERM to cut your entitlement and make you do this? The answer is no. We're working with representatives of particular areas. It's a voluntary process, and one that groups such as the BSA have raised. It's something that we think is a good solution, and one that will work for those people that want to make it happen. No one will make you enter into anything that you don't want to do. We're looking at collectively working with a group of people to look at all the issues, work through the different scenarios and find the best way to put this into place. This will

involve talking to government about what we want to do and ensuring that the existing rights of irrigators are protected. If it doesn't suit irrigators, then it's not the right solution.

**16. I understand that Arrow is doing the EIS process voluntarily? What is the purpose of this? Why not wait until you are asked to do it?**

We made a decision as a company early on that we would need to undertake an EIS as part of the process. We believed that rather than wait for one to be mandated, it would be best to just go out and do it. You actually have to apply for an approval to undertake a voluntary EIS, and we did that.

**17. Other companies have applied for their projects to receive significant project status. Does Arrow intend to apply for this status?**

You can apply to the Queensland Coordinator-General for 'Significant Project' status which means that your project is assessed under the Coordinator-General's framework. There is a different framework under the *Environmental Protection Act* and Arrow made the decision early on that it wanted to complete an EIS under that legislation, so we didn't seek significant project status at that point in time and nor are we going to now. That said, we have a number of EISs underway as there are a number of components to our project. One of these is the LNG plant on Curtis Island which has significant project status. Shell was originally doing that EIS and the work on it has continued with Arrow now responsible for it (under the Coordinator-General framework). The EISs for the Bowen upstream developments and pipeline projects are being assessed under the EIS process in the *Environmental Protection Act*. If we wanted the Surat Project to be changed to an assessment under the significant project process we would have to start from scratch.

**18. The Terms of Reference for the Surat Gas Project talk about the inclusion of a consultation report, and that you are required to identify the interested and affected people and summarise your consultation with these people. I assume that these consultation sessions we are having now are part of that report and process, and that you have to address those issues. Given that there are issues that we don't necessarily feel have been addressed (regarding activities on black soil and groundwater impacts) and given that there is quite an overwhelming lack of support for the project, will this be identified in the EIS report?**

They will be. The purpose of the EIS is to identify all those issues, understand and document all the concerns, and come up with strategies as to how we will manage them. They will be taken into consideration in that process. After the EIS is submitted to government there is a public exhibition period to allow for comments so you will have an extensive opportunity to comment on the document.

In terms of the EIS, we won't presume to put words in your mouth about how you feel about the project, we will be listing the issues you have raised and summarising the consultation sessions like today. Through the submission process you will have the opportunity to raise those issues in a formal sense. An important point is that the consultation report will not be written by Arrow, it will be written by JTA.

**19. You've mentioned some of the benefits that our community may see through advanced exploration and production in our area – sponsorship programs, education and traineeships etc. I have a list of the concerns of the community, how are you going to counterbalance these concerns to make us feel good about you**

**coming onto our land? The concerns are the risk of de-watering the Condamine aquifer, contamination of soil, unsuccessful rehabilitation of soils, loss of farm production due to competition for area, capital value loss, noise pollution, reduced air quality, loss of privacy and security, competition for labour, increased costs of service providers, road upkeep and interference with slope characteristics on farms due to buried pipelines. What are you going to do to counter balance these concerns – offering a traineeship simply isn't enough.**

Of course we understand that something like a helicopter service will not balance out all your concerns. What we're saying is that in order to operate in these regions and communities we need to pay our way. That happens at different levels. We have compensation agreements with individual landholders. We also recognise that not everyone who is affected is on a farm, there are the people in town and the community generally who are also affected. We're not trying to buy a social licence; we will earn our social licence. With our Brighter Futures program we are trying to put something back into the community, and today we have made an honest attempt to show you what we have been doing. The issues that you list are concerns we have heard before, and we are working on these in many different ways.

- 20. I have two questions which relate to the physical footprint on the land. Firstly stemming out of what happened on Tom O'Connor's property? For some time we have been getting our minds around the impact of a well site. My understanding is that there has to be access to that well site for all your machinery; at the recent incident there was enough onsite machinery to fill half of Cecil Plains. Intensively farmed black soil just doesn't accommodate that type of machinery. If you have to have access at a moment's notice to respond to an incident you would need a significant hard stand area to manoeuvre equipment like that to actually get to the site. This greatly multiplies the potential effect on our land, especially on previously unaffected areas. So, my question is, is the impact on our properties as we were told previously, 20m x 20m with access tracks or will you have to have access with a moment's notice to wellhead sites?**

Some of the literature here today mentions 'workovers'. Generally that is something that doesn't happen at a moment's notice. The work that was going on at Daandine was planned. A workover basically takes out a broken pump and puts another one in. Over the life of a well, that will probably happen every two to three years. It generally wouldn't require as much equipment as was used on that property. We had extra water tankers there as part of our contingency plan so we could properly kill the well. We would most definitely require the rig, the mud pump etc. One of the reasons why this area is not on the timeline is because we haven't yet figured out how to do a workover out in your paddock and manage those impacts. It's going to take a considerable amount of time to properly work these issues out, it's been built into the plan that we don't intend to develop on this land for many years, because we don't have those answers yet.

- 21. Unfortunately your assurance about when you're coming out onto the floodplains doesn't leave us completely satisfied. Within the last year we were here in this hall and you made those same statements. But what you didn't tell us was that you had an application to convert part of the ATP to a PL right outside here. That PL covers part of the floodplain. So technically speaking you have approval for 50 wells out there. That doesn't give us much confidence in what you're saying.**

I can see how you might interpret it in that way. But our development plan shows where we intend to develop and we do not have any plans to develop in this area as we do not have these answers yet. We do intend to develop on the area to the west of the Condamine River which is in those same petroleum leases because the land impacts are significantly different.

That petroleum lease was applied for a number of years ago in 2007. The only reason it wasn't granted straight away is that a number of coal mining companies hold tenure here as well. The way the government works is that the mining company is required to give its consent to grant a petroleum lease. We should have drawn attention to it. A petroleum lease is defined by square blocks not limited by any geographic feature but a particular block (one minute of latitude by one minute of longitude) doesn't necessarily mean you go and drill in the area covered by that PL.

**22. In regards to gathering lines it's been reported that in production areas away from here some companies have demanded control over operations allowed to happen over the gathering lines to guarantee the integrity of those lines. This leads to a 20 m exclusion zone. Do you require control on the areas above the gathering lines?**

On a steel transmission line, it is traditional practice for the pipeline owner to have some control over the land above. If a digger accidentally damaged the pipeline, it would create significant impacts. For the gathering systems we design those in consultation with the land users and there are no restricted zones as such. We compensate for the strip of land where the pipe goes through. Part of the compensation arrangement is recognising that we might have to come in and do some maintenance or slash an access track. We have recently provided an awareness program for landholders in our production leases about the risks of doing something unusual there. We ask people to call us first before doing something so we can come out and have a look at it, before some major issue arises.

**23. I noticed you are not using the piezometer nest<sup>3</sup> holes for your water monitoring; rather you are using a single piezometer down the well. I was wondering how far apart these wells are so you can tell what is happening in those other aquifers. How far laterally is that next well?**

Above the coals we want a piezometer as close as possible to the interface between the Walloons and the immediate unit above it. So whether it is the Condamine Alluvium or the Springbok Sandstone...where that coal finishes we want something pretty close to it to be able to achieve accuracy.

The design we have there for one part of the well would be in the deepest formation we are interested in, for example the Hutton, and then the piezometers are on the casing beyond that same well. So they are not nested in the sense that there are multiple openings the other gauges are cemented in so they are all in the same well. The lateral spacing from there depends on how transmissive the coal is, so you step it out if it's very transmissive and it'll be closer together if it's not very transmissive. We're gradually bringing the program in so where we're targeting initially is around existing production and

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<sup>3</sup> A piezometer is a borehole designed to measure groundwater conditions at a single point within the aquifer. A piezometer nest is where a number of piezometers of varying depth are constructed at one location.

from there we'll see what the impacts on the coal are, and from there we'll know how far we have to step out.

**24. You mentioned before that there is the potential for significant groundwater impacts to be unable to be mitigated. What would constitute that?**

That's something that we need to collect more data on to see what those impacts are. At this point there is nothing to demonstrate we're heading down that path but if risks are identified such that our parent companies decide they do not want to proceed on that part of the project that will be a decision they will make when it comes to the final investment decision.

**25. What are your expected takes for the Walloon Coal Measures?**

We're estimating 25 gigalitres per year. That will change over time. As we move to different locations new wells that we bring on line will have a ramp up phase during which the dewatering phase draws off water, and then decreases in volume after a relatively short period. So by bringing new wells online over time you get curves in water production and by joining these together you get a relatively flat production profile.

**26. So you'll have 25 GL that you can match against that for substitution?**

Yes, the idea is we use that 25 GL for substitution so that as we produce the water it feeds into the process.

**27. I see that other companies such as Santos are using electricity for their wells as the gas is too valuable to use to drive the wellhead. Is Arrow looking at going down that path? And will supply continue for domestic gas users?**

Yes, roughly speaking at domestic gas prices it is slightly more efficient to have well site generators. As the value of the fuel goes up, it changes the relative economics if we can buy power at a cheaper price. There are also some significant benefits we can gain by putting underground power in; visual amenity is improved and it doesn't impact on crop-dusting. There are some limitations because with underground power the heat doesn't radiate off, so we need a bigger cable which makes it more expensive. It also relates to the sort of pump we are using so if we were using electric submersible pumps and could take underground power to our site, we could fit our wellhead into a substantially smaller space than at the moment. However, we haven't yet proved the use of electric submersible pumps. There are a lot of competing technical, economic and environmental factors that we have to take into account. The best solution may change depending on many factors such as where the source of the power is (i.e. a local power station), suitability for landscape and land use. There will not be one answer for the entire project.

**28. Please explain how drilling a gas well will not allow poison from drilling getting into the Great Artesian Basin when the drill head has to be drilled ahead of the casing? The water and gas is under high pressure the moment it is released.**

I think the crux of that question is the word 'poison'. We do not use poisons. I know there is concern about BTEX chemicals and the fracking process but we currently do not frac in the Surat Basin, and have no plans to do so in the project area. In terms of the fluids used for drilling, in most cases they are very common products such as Bentonite clay, salts etc.; they are not poisons in the sense of being nasty chemicals. There are also two different drilling methods; what we call overbalance, where we pump water down, and the pressure from pumping that water down might encourage it to flow into the formation. The

alternative to that is called underbalance, where we encourage the water from the formation into the hole. We can do both of those, it's just a bit of a different set up for the drilling process. So there are ways and means to stop the release of any drilling fluids into the surrounding formation from happening.

**29. I'm thinking more of the salts and heavy metals in the aquifer you are drilling into escaping into the GAB rather than chemicals you put down the hole yourselves.**

We have not found dangerous chemicals in the water.

**30. Do you completely ignore all the experience and knowledge of the hydrologist John Hillier in terms of his report on groundwater in Queensland?**

We don't disregard science and fact. If you look at our own interpretation of the Condamine Alluvium contact and groundwater model and you look at Mr Hillier's and Mr Huxley's and the work DERM has done, you will see there is a growing understanding of that contact. You go further and further each time, it's like an evolution to gain a greater understanding of the issues.

**31. On *Four Corners* John Hillier said he expects a 5% failure rate of your drilling to escape into the artesian water.**

I'm not sure where 5% comes from, that's not our experience with drilling. Our experience in drilling is that we design the well before we drill it, use the correct equipment, trained people and the right procedures. As we drill the well, if things go wrong we make the decision whether to fix it or to seal and abandon it. We don't work with failed wells, it's either a successful well or we seal it.

**32. In the event of any failure does the CSG industry understand the consequences for Australia if the water in the GAB is rendered undrinkable?**

If we were going to do substantial long-lasting damage, we wouldn't go ahead with the project; it's as simple as that. The GAB is a massive basin; we're talking about a very minute area of water compared to the water in the GAB. We couldn't damage it, even if we tried.

**33. Why should Australia run any risk to our water supply when the benefit of the project is for foreign use and foreign profits?**

We think there is a way to do this where we won't have those impacts. Already a lot of that gas is going to local electricity generation and other industrial use. There's a balance here between looking after the environment and the GAB, and getting energy out for people to use.

**34. According to the Arrow Energy website each resource area will have approximately 1,500 production wells and 5 integrated production facilities. Will any of these production facilities be located on the floodplains?**

An integrated production facility is quite a significant thing, so no. There is a certain distance of 20-25km we can haul gas through the pipes without compression. If, for example, we needed to haul gas 40km, we could establish a field booster station which looks a lot like an enclosed substation that you might have seen in Toowoomba or Brisbane. That is the extent of what will go out there. There might be clean water dams for reticulation of water for beneficial use, and little fuel booster stations. But nothing like what you may have seen in pictures of Tipton or Daandine.

**35. If there are no chemical compounds in the CSG water why would the government have allowed for pre-existing BTEX levels in its fracking framework?**

In regards to BTEX, it can be naturally occurring in all sorts of environments. Our wells are designed to extract water to the surface as part of the production process; we are not pumping it below ground. The well integrity programs and the maintenance and inspection programs we put in place ensure we're not getting cross contamination of aquifers.

**36. Can landholders access daily drilling logs to check the integrity of the strata formations before production commences on any Arrow lease? The information goes to DEEDI, but there appears to be no scrutiny of it by DERM.**

The daily driller's log is more a timesheet of what has happened in each shift. Under the *Petroleum and Gas (Production & Safety) Act* we are obliged to provide a report for every well we drill, summarising all the details of that well. It would be very difficult to derive an understanding of the strata integrity solely from the daily drilling logs, since these only detail events on the rig for invoicing purposes.

There's a timeframe within which that report must be submitted after completion of the well drilling. If there are any queries about well integrity or the formation or geological strata then there is a decision to be made whether to proceed or abandon. The lifetime of a well can be more than a decade, so we have plenty of time to respond to any kind of issue that may arise. Well completion reports are available from DEEDI but it would be up to government to establish appropriate resources to scrutinise this information, it is not really up to us.

**37. I don't see the reason why you're doing these community meetings. Effectively you've annexed part of the floodplains east of the river under the authority of an EA. Why do we as a community have to beat up companies such as Arrow to go further than the legislative requirements? You talk about Brighter Futures and building up the community, and yet it was a disgraceful oversight that at the November community meeting here you failed to notify this community that you had in place an application for a Petroleum Lease. Sure, you met legislative requirements and put a postage stamp sized ad in the *Dalby Herald*. Why don't you notify those individual landholders that they're about to have a PL granted over their land and get them to respond? Why did you not tell us in November?**

We have made a commitment not to develop on land east of the Condamine until we have resolved a way forward. That is our promise, regardless of where our PL might be. There's not some subterfuge where we're trying to sneak some development across the Condamine. When we make a commitment as a company we stand by it. We've written these commitments down and published them in newspapers and on information sheets. We stand by those. The fact that the PL covers a boundary does not somehow remove from us the need to resolve those issues.

**38. There are people in that PL who aren't aware of the situation. You have 50 or 60 floodplains farmers who are now under your PL and have not received a letter or any notification from Arrow that this is the case. Surely, if you are trying to gain a social licence you should at the very least notify people of changes like this. Arrow has missed an opportunity to make a positive social connection here.**

That is a good idea, something we haven't done in the past. The fact that we didn't draw to your attention the application for a PL wasn't a deliberate ploy, more an oversight on our part. I understand what you're saying, and this is something we will definitely take on board about the need to notify landholders when a PL is to be approved over their properties.

- 39. Comment from the Deputy-Mayor of the Toowoomba Regional Council (TRC). We've had some concern recently around exploration permits being sought quite close to suburban Toowoomba. Based on the knowledge available, we strongly resist the movement of the CSG industry across the Condamine. Most councils are keen on development, but TRC has made a very deliberate decision that it is not keen to see the CSG industry come across the Condamine with the current knowledge that appears to be on the table, and the current community concerns. Something raised many times today, and something to remember, is that this kind of land does not grow on trees, it's vital for the future of the state, the nation and the world. Local government is fairly impotent in this process; the state government certainly runs this, council mostly monitors and puts up with the impacts. When the project is deemed of state significance, we're right out of the loop. So I think you are doing the right thing by consulting with people, but just to let you know the TRC has made its decision based on the current information.**

We hear you clearly. We are at a certain point in our investigations, and we know that we need to work out these issues. We just want the chance to work them out and then to be able to present the information to you all.

- 40. In terms of the buried infrastructure, are we still allowed to farm over the top of it? You said that landholders will be compensated. If a landholder is going to be compensated, and we can continue farming, does that mean we have to give access or a right-of-way?**

Yes.

- 41. Does that mean every wellhead that has underground pipes associated with it requires a right of way or an easement? What about roads – how big will they be?**

It's not an easement, but it is an effective right-of-way for every production well – not exploration wells as they are not connected up to anything. If we form roads they will be put on that same parcel of land, historically the corridor beside the pipeline. Many of our roads are no more than graded farm tracks. We do have some engineered gravel roads which are used for entry to compressor stations and major water treatment plants but everything else is basically a graded farm track.

- 42. Does your commitment not to come onto the black soil until 2023 still stand?**

That was our indicative development plan at that time. As we do more appraisal work the development plan will change. But we don't feel like we have all the answers yet, and until we do, we will not be coming onto this land to develop it.

- 43. Do those concerns you have include water and soil concerns?**

Yes. The water concerns have to be addressed first. Water issues are part of the EIS, so these issues have to be addressed as part of the EIS.

- 44. I've been advised you have just finished your first round of modelling. But it seems apparent that you need to do a lot more work to fully understand all the issues. Are you saying that you will not be coming onto the Condamine Alluvium until you have completed this further modelling?**

We have to complete and have that modelling reviewed before we can issue our EIS. We have to have that done before we can get any approvals to progress with our project, and before we do that we will also have to take a final investment decision.

- 45. So you won't be releasing your EIS in the final quarter of this year, or early next year? It appears that the modelling you need to do will take many more months than that.**

We acknowledge we are a long way from finishing this process but what we have achieved is a broad understanding of how the water moves, and predictions of what we think will happen. What we need to do over time is collect more information so the density of data in our model can be refined to a smaller lateral extent which is the only way we can improve the level of certainty. So it's an ongoing process.

- 46. So all you require for the EIS is that broad analysis?**

When I say broad analysis, it's based on a one kilometre square grid which gives us a very good understanding of what will be happening in terms of trends, water flows etc. So at this point in time I think we have enough to take that next step.

- 47. The Meenawarra Pilot and the River Road Pilot, have these happened? What were the results of the Meenawarra Pilot? Was there sufficient gas there to warrant going to a PL?**

Basically the findings were inconclusive as the production data was inconsistent with the log data. The log data seemed to say that it would be a good production area, but the production data had much lower water rates and we're still investigating why that happened.

- 48. So is the reason why that site has not been rehabilitated because there is a possibility of further activity in that area?**

Yes, that is one of the reasons.

- 49. In relation to your assurances regarding production on the flood plains, your Environmental Authority gives permission for 34 core wells and 36 appraisal wells. My understanding is the appraisal well process would involve 6 or 7 wells at each site. I wouldn't like you or anyone else to think that an exploration pilot is not invasive. A 6-well pilot basically destroys a farm. So your assurance that you are not going to develop on the floodplains, does this extend to pilot projects on private property on the floodplains i.e. you have no intention to put a pilot on the floodplain until issues are resolved and agreement is reached?**

Yes, that's right; our commitment includes any activity on the floodplain. The only thing we want to do is put in water bores to check the conductivity within the Condamine, and the water bore and drain. Other activities are incorporated into our commitment. Pilots are at the higher end of exploration activity.

- 50. Arrow already has approval to drill 250 LNG production wells. Of these 50 are in PL258 which surrounds Cecil Plains and extends out onto the floodplain. I live in**

**PL258 and around 90% of my neighbours are unaware of their current CSG status. If you are looking to establish a win-win relationship with the community, you need to start educating people by sending out information even if you don't have to.**

We have our decision point in 2013, provided that we get all our approvals. Only after that will we drill for gas. While we do have dots on the map for potential future wells, until the final investment decision (FID) nothing will happen.

That authority you are talking about is the Dalby Expansion Project Environmental Authority which we applied for in late 2009. At that time we were doing a different project called Fisherman's landing, a project that Arrow as an independent company was proposing to do. The number of wells and project facilities applied for were consistent with the requirements and timelines for that project. What happened was that the EA got tied up in the approvals process; it was granted in December 2010 and came to us in March 2011. But it was based on the work activities we intended to do for a completely different project. If we had gone ahead with that project, if our plans had stayed the same, our land agents would have had those conversations with all the landholders in that area by now.

- 51. My suggestion to you is in regard to your website which shows where the pipelines were to be. Now you're saying that they are not going to be coming onto the black soil. It would be helpful to be shown the whole pictures (or take it all off) because we plan generationally. Currently I can see a well site planned 200m from my house and this does not give me any confidence for my future.**

We wish we understood what it would look like, that would make it a lot easier for us. Until we've done exploration and appraisal we can't know what the development will look like. We've been putting those maps out to try to assist with the picture but it probably won't look like the maps we have here.

**Comment - We plan generationally, but we're going to lose a generation because who will want to take these farms on? There is a stigma attached once you come on our farms.**

**Comment - If you had gone ahead with that other project you said you would have been talking to landholders. However, you would have been talking to them at a point when they would have had no say in that Environmental Authority. You need to notify the community when you are submitting your applications for an Environmental Authority. If you don't give everyone the opportunity to comment, you're not involving them.**

- 52. The Surat Gas Project extends from Wandoan down to Goondiwindi. There are many different soil types within that area. Will you develop a standard operating procedure for every different soil type in your operating area?**

Yes, we will probably end up with standard operating procedures for each activity and each land use and soil type, because we will be doing things in different ways for different areas. We have developed a standard operating procedure for drilling and exploration on black soil through consultation with the Arrow Intensively Farmed Land Committee and the Arrow Surat Community Reference Group (CRG). Rehabilitation is included in that.

- 53. How do you establish a standard operating procedure? Do you conduct trials or experiments? Where will trials be conducted... on Arrow land?**

For most of the things we do, there is a range of different ways and methods we can employ. To drill on black soil, we drafted the basic procedure, identified what the impacts were, and took it to the community reference group which assessed it, identified other impacts and rated them. Arrow then identified potential mitigation strategies and developed the necessary procedure; the next step is a field trial. We haven't done the first hole yet; we've identified the rig and the crew for the rig, as it's important to use the same rig and crew. We will then do it on some less sensitive land types, practise the procedures and then move to the test case. Rehabilitation is part of that procedure, so we will have to rehabilitate the well. Generally when we're doing something new, it's on Arrow land first then we move to landholders with less sensitive land and one has volunteered to trial this.

**54. What is JTA's role here? Where does the information from our questions and answers go? We received notes from the last time, and I felt that some of the questions and answers were changed.**

Leanne and Victoria from JTA are taking written notes of the proceedings; they will not be verbatim notes but are definitely not sanitised. The notes will be edited by JTA though to remove the ums and ahs and make them more readable. JTA's role here is to assure attendees that their questions haven't just been heard by Arrow, but the wider community will also hear them through our summaries of the session. Arrow brings us in as a third party to organise the consultation and prepare the EIS consultation report. After these sessions JTA and Arrow sit down together and discuss what could have been done better. JTA's job in terms of the summaries is to help Arrow pass on the information and to make sure it's understandable even to those who are not in attendance today.

**55. Question directed to Arrow CEO, Andrew Faulkner – what's your personal view of accountability given that we have seen CEOs from the global financial crisis to the Deep Horizon incident walk away from disaster? People want to see accountability for CEOs of large corporations.**

Where I come from accountability comes from the top and stays at the top. So at an event like today the experts are speaking with my voice. I am aware of what they are saying, and they have my support. I have every expectation personally to be here for some years and I know the parent companies plan to be here for many years to come. Both parent companies are global entities with very high standards and business principles which they expect their staff to uphold. I hope you can have confidence in Arrow Energy because of the robustness of the parent companies and through hearing and seeing the quality of Arrow's staff.

**56. In light of BP and the Deep Horizon disaster, and the fact that CEOs of failed US financial institutions walked away from their companies (after they fell over, despite US Government prop-ups), with multi-million dollar packages isn't it reasonable that there is scepticism when someone like you says you and your overseas parent companies are in it for the long term? There is a long sad history of a lack of accountability on the part of large corporations.**

I do see that it would be easy to draw conclusions like that. The GFC provided examples that I understand people can find intensely frustrating but I think it might be too broad an assumption to tar everyone with the same brush. I would put emphasis on, and take comfort from, the fact that Arrow's parent companies are two of the biggest companies in the world, and have been around for many years. They are not fly by night companies who looking for a quick buck.

In regards to foreign ownership, Shell Australia has been investing in Australia for 130 years and will be investing five to seven billion dollars in the next couple of years. Projects like this require huge investments. I heard the comment earlier that with foreign ownership the profits go out of the country. The point I would like to make is that companies like Shell and PetroChina are investing in a greenfield project i.e. right at the start. They will be spending in the order of tens of billions of dollars in Australia long term so we all benefit from that. It's therefore not entirely correct to say everything goes overseas.

**57. That leads on to an interesting point. If you've invested so much money in this project when you have to look at the cost versus the risk won't that provide a greater incentive to accept a much higher level of risk? Without a high level of accountability the temptation to accept higher levels of risk may play a big part.**

I would have to look at that the other way. If you have two companies who have publicly invested \$5 billion in buying Arrow Energy you don't invest that much money and easily walk away from it. In the years after that, the period we're in now, we spend in the order of \$700 million a year. Increasingly the two companies are building up their commitment. That's not something that you risk or walk away from. It just demonstrates an increasing commitment to Australia and to the project. In terms of accountability and responsibility, why would they want to walk away from that?

**58. Did PetroChina exist before 1948?**

PetroChina has been in existence for over 100 years. It has long existing indigenous gas resources in the north and north east of China, and employs more than 1.6 million people. If I think of how Arrow has morphed, in terms of accountability, responsibility and robustness, it is now in a much stronger position.

**59. In terms of accountability, you are clearly aware of the legalities regarding how corporations can be prosecuted. By definition it means there is a lack of accountability at a personal level.**

If Arrow does something illegal, along with the penalties on it, I could go to jail. The Board, as directors of Arrow Energy, have absolute legal responsibility. They too can be prosecuted as can our parent companies. They are global companies with global reputations. Arrow is also building its reputation; it is a Queensland company with a large domestic business. Reputation and responsibility are important to us.

**60. At the last meeting in November I asked if you could provide a list of the twelve drilling fluids. Could you also provide water quality data from your reverse osmosis (RO) water and the chemical analysis of RO water?**

The list of drilling fluids is available in a fact sheet and all fact sheets are available on the Arrow Energy website. One of the issues is that Arrow is not actually producing that much water. It has been sitting in a dam for quite some time because we're not currently allowed to do anything with that water. We can provide historical data.

**61. In the Environmental Management Plan for the Dalby Expansion Project it states that several activities to be undertaken by Arrow are 'of concern' including the loss of the agricultural land, water impacts etc. What does this mean?**

The Environmental Management Plan and the Environmental Authority for the Dalby Expansion Project are currently before the courts. That is something we cannot comment on.

**Dalby Technical Water Session**

Date:	26 May 2011	
Venue:	Dalby Showground Pavilion	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Dr Lloyd Townley, Director	NTEC Environmental Technology
	Carolyn Collins, Environment Manager	Arrow Energy

**1. You say there will be a drawdown of one to four metres by 2065, what volume of water does that amount to?**

We received the first results of our modelling program only last week so we need to work through that information before we know anything definite.

**2. In regard to the cumulative effect, how many gigalitres will that be? What are the volumes of chemicals used that could potentially get into the GAB? It is not just the quantity, but the quality of water that is important.**

We have committed not to do any fracing in the Surat Gas Project area. In other areas where we have fraced i.e. the Bowen Basin, the chemicals used are very benign (e.g. chlorine and vinegar). We don't have to extract very much water but as we do extract water it reduces the chance of contamination.

In the context of the ideal section, in a natural system recharge will occur in the high land and then flow down into the confined aquifer. Pore spaces are full of water in the saturated zone; in the coal layer gas is squeezed into the spaces between the water and the coal. By reducing the head as part of operations, the tendency of the chemicals is to move upwards with the extraction, not out into the water systems.

**3. Question to Lloyd Townley. Can you put your hand on your heart and say contamination won't happen?**

I am an independent reviewer of Arrow's modelling program. At this stage I do not have enough information to promise anything.

**4. What will be the volumes of produced salt going to landfill?**

At this point we don't have a full field development and production profile so we don't have a definitive answer. The water has roughly one sixth of the concentration of salt in seawater. At this point we have not identified a landfill to use; we will be looking at many options for how to manage the salt. We will be talking to the other CSG companies regarding salt management as the volume we alone produce will not be sufficient to enter into a commercial contract for supply of salt for a beneficial use, such as commercial or industrial options.

**5. Do you have an estimate of the percentage of water extracted from each well?**

That will vary across the landscape from well to well. It is too early to give that sort of quantification. The asset team will be able to give more of an idea of current quantities later today.

**Dalby Community Information Session**

Date:	26 May 2011	
Venue:	Dalby Showground Pavilion	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Tony Knight, Vice-President Exploration	Arrow Energy
	Darren Stevenson, Asset General Manager South	Arrow Energy
	Carolyn Collins, Environment Manager	Arrow Energy

- 1. With regard to exploration wells and monitoring bores and your compensation structure why is it that you go to one landholder and, when he refuses, you offer the neighbour double. How can you explain that, please? This happened recently, within the last fortnight.**

Arrow has been exploring in the area since 2000 and this may have been the case but not now. There will always be differences in compensation because the amount agreed will depend on the land use and Arrow's proposed activities amongst other things. Arrow is trying to put in place a system that is transparent for all landholders.

- 2. I was under the impression that as part of the initial exploration an assessment is done. My property is only two or three kilometres from the other one...**

Compensation is linked to how many wells as well as other factors. It is not open ended.

- 3. Can an agreement include a condition that there is a maximum number of wells?**

Arrow is required to enter into an access and compensation agreement with the landholder. Once the agreement is in place, notice of entry is required. We have got to get the access process in place first before we come.

If we are going to conduct activities that have impact, we need to enter into an agreement with the landholder. These activities might include drilling, cultural heritage assessment, ecology clearances, and ground truthing<sup>4</sup>. These all have to be arranged through land access agreements.

As part of the preliminaries, land agents will sit down with landholders and discuss possible activities. If we want to do an exploration well there will be a discussion on its potential site; if the proposed site is unsuitable to the landholder then there will be a discussion re a more acceptable site and access arrangements. Once these are agreed, a discussion on compensation will occur until an agreement is reached and executed.

In regards to your specific question on the number of wells, if Arrow specifies ten wells in the agreement then that's it. If we wanted to do another ten, we'd have to come back to you and go through the whole process again. Just remember we are doing exploration wells at the moment and the wells are spaced at considerable distances apart. Since properties in this area are relatively small (unlike the Bowen Basin) the number of wells per property should be relatively small. Where properties are much larger e.g. the Bowen Basin some landholders can have up to thirty wells on their properties.

<sup>4</sup> Ground truthing activities provide confirmation of what is on the ground e.g. ecology assessment, survey, cultural heritage assessment etc.

**4. What rent do you pay? What if your activities stop?**

Compensation consists of a few things including rent and land disturbance. Part of the process is to understand how the land is used and what it is worth.

Loss of productivity is factored in, as well as your time and the cost of professional fees for any advice you might decide to access. Because of all these factors, compensation can be significantly different between properties. Also, if the agreement covers a number of years and we elect to pull out earlier we continue to pay compensation for the agreed period.

**5. Do production wells have a built in time limit?**

They can produce for ten to twenty years. Once finished, we come in and plug the well and remove any equipment. Arrow has obligations under its environmental authorities to return any site to substantially the same condition it was in before it started.

**6. Does the initial agreement last four years?**

The initial agreement will last the length of the petroleum tenure which could be thirty years.

**7. Do you know of any approval to come onto our flood country?**

There are a number of regulatory conditions in relation to where we site things; we take into consideration flood plains and overland water flows. They can be quite different, for example wells are quite resilient to flooding but facilities such as dams have very specific rules in terms of where they are sited.

**8. If there is agreement on ten wells and the gas price doubles and you find you want another ten wells, you have the law of the land on your side to basically force the landholder to an agreement. Is this how it works?**

Legally we have some rights. However, we cannot rely on those rights to just do what we want. We want to behave in a way that is fair and reasonable. I understand that some people are concerned about some of the backstop rights that petroleum companies have through the Land Court. There is no point in Arrow beginning a twenty year relationship in an adversarial manner; it has made some mistakes in the past and is working to improve in those areas.

In relation to drilling more wells, Arrow will base the economics of the project on a particular well spacing. Once that is decided we will not come back and drill more wells at smaller spacing as it is not economical to do so.

**9. What volume of water would represent one metre of drawdown?**

Arrow only received those results last week. There might be a 2.5m impact on the western side but the modelling shows a low of 1.5m and a high possibly of 4m. There is still more work to be done on the modelling and we will have all that data when we return in September/October with the full modelling.

**10. This word compensation is really starting to get up my nose. You've got the attitude that your business might add value to mine. Compensation implies that you're compensating me for a loss that I have not yet incurred. If you developed a positive attitude and came up with something like a business plan that adds value**

**to my enterprise along with yours, we could move forward. Until then we're going to have a civil war.**

I appreciate that feedback and have received it previously. I'm told just the word itself can upset people because they don't believe it should be a 'nil sum game'. The next step will involve landholder groups advising us on these matters, feeding back to us what value-adding looks like from a landholder's perspective. I understand that we have to get that feedback to get the relationship right.

- 11. I don't think you really understand the disruption that happens on our land before you get to the exploration stage. My son was to buy out my land and we should be well on our way to negotiating this happening. But we now have this grey cloud over us and he doesn't want to be involved as he is just jack of this whole process. And that's before you even put a well on my property. I'm just wondering if you understand.**

I'm not in your situation so I can't say I know exactly how you feel. But I do understand that there may be uncertainty in your future.

**Comment - You talk about compensation. I had one conversation and then you went. In one day we had 27 vehicles go past. You're talking about value-adding; all you're doing is negative.**

- 12. I agree with Pat and Lance. I simply don't want you on my place no matter what. I don't want your money; this is my life and livelihood. So when you come and say where you want the wells and everyone says no, are you going to push your way in?**

No, we're going to need agreements to do that. We do understand the concerns and believe good relationships are good business; forcing our way onto your land is not good business. No one wants that, especially Arrow.

From 2000 to now has been a steep learning curve, and we've acknowledged mistakes. What has now changed is that we have taken your feedback on board and are about best practice. You need to let us demonstrate that we can do this in a way that is not disruptive. We have wells in the Bowen Basin which fit in with the activities of graziers up there. We can provide examples to give people confidence and to be willing to engage and compromise with us. We think there is a way forward so please keep your options open.

**Comment - I think your parent companies have made a mistake. They looked at the map, did their surveys and decided that what was below the ground was more important than what was above the ground. I put it to you that you have made a mistake in choosing this land. This land is the best in the state so it is your problem not ours.**

- 13. Tony, would you like a well in your back yard? Other companies have answered no, and they're honest. What about you? Would you like a hole and a rig in your back yard?**

The answer is clearly no but Arrow will not put wells close to where people live. The unfortunate issue for Arrow is that there is a coincidence of geology and geography coming together. There is a need to supply gas and energy. We have to find a way to get

it out of the ground. If we believed it could cause a major environmental impact or risk the future livelihood of families we wouldn't do it.

**Comment - We have no rights, what do we pay rates for?**

- 14. Arrow energy does have wells within 200m of houses. You've been on my father-in-law's property for two years and we're still waiting for the mess to be cleaned up. How much longer do you need to make it right? We've been having this conversation for twelve months.**

We want to work it out and have that conversation with you. We need to sort out access arrangements and have that discussion with your father-in-law.

- 15. Does Arrow have any specific intention or policy in relation to strategic cropping land?**

Arrow has made some commitments about intensively farmed land. There is some overlap with strategic cropping land and Arrow will not do any development in those areas until it has a way to manage the impacts. It's in the process of working with landholders who have those land types.

- 16. In relation to 'make good' notices who or what decides if you have 'made good'? Surely anyone can see from the wells you install that there's no possible way to put the land back the way it was. There will be some cases that you can't make good if you contaminate our aquifers.**

'Make good' has an official meaning regarding water impacts. However, in terms of rehabilitation and land clearing there are specific legislative provisions in our licence to operate as to what is required and these conditions are much tougher than previously. We need to enter into an agreement regarding the type of mitigation measures to be implemented and that agreement will be between Arrow and individual landholders (with an opportunity for government to step in and mediate).

- 17. Obviously 'make good' is a bit of a worry. If my bores were to stop operating because the underground water had somehow been disrupted my land value would go down rapidly. You can say you'll cart water into my property but how is the Great Artesian Basin (GAB) going to re-establish itself with the activity that is going on?**

We talked earlier about the groundwater modelling. Let's assume that model was acceptable then there would be a monitoring program to assess what was happening. You mention the GAB...this map shows just how massive it is; the volumes of water in there are immense. When you look at the volume of water that we will extract it's an incredibly small percentage of that. I've read media reports that the CSG industry will destroy the GAB... it is so dynamic that we couldn't do it even if we wanted to...which clearly no one wants. What we're trying to explain is that some of the media comments are based on sensationalism. Our modelling predictions come nowhere near the scales bandied about in the media.

- 18. It's an impossible scenario as the water is not reusable.**

All that has been shown so far is an indication of the scale. The plan is to return in September or October with the completed model and independent experts to explain what is good and what is not.

**Millmerran Community Information Session**

Date:	27 May 2011	
Venue:	Millmerran Community & Cultural Centre	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Tony Knight, Vice-President Exploration	Arrow Energy
	Darren Stevenson, Asset General Manager South	Arrow Energy
	Carolyn Collins, Environment Manager	Arrow Energy

**1. In relation to the information provided re the predicted loss of one to four metres in the Condamine Alluvium (CA) and Walloon Coal Measures (WCM) by 2065 why would there be that loss?**

The modelling that has been done provides a prediction only and assumes that Arrow Energy would do nothing to mitigate the potential loss (which of course is not the case). In relation to connectivity, as soon as you hit the water table the sand is saturated with water as the pressure head is higher than the WCM. There will be movement between the CA and the WCM.

Coarse sandstone with artesian head will have different pressure and there will be a small amount of leakage between the layers caused by lateral movement.

**2. So you are saying you've got to suck the water out to remove the gas? What will happen to the existing bores?**

Yes, we have to remove water to reduce pressure; this means the level will drop in the Walloon Coal Measures. Now that we have the initial modelling results we need to go back into the model and work out the volume of water represented in the level drop. Arrow will explore substitution of allocations to see how it can prevent that drop. Once we know the total volume of water that will be removed we can look at mitigation options.

**3. Does that mean you don't have a plan now?**

Arrow has 'make good' obligations in perpetuity in regard to water. We will have intensive monitoring programs, particularly in regard to interconnectivity, and will make sure that you have a water supply of the same quality. The monitoring program is a very early warning system; if there is something that we haven't understood, we have to work to make sure that we do. Arrow is committed to making sure it does not have a negative impact.

**4. Irrigators are allocated a certain amount of water. Are you restricted in the amount you can use? And if your company goes under, who will compensate us?**

The short answer is that Arrow does not have an allocation. However, there are other legislative requirements plus different obligations in regard to groundwater...and government requirements will increase. That said, Arrow is in the gas business and the less water we take the better. We don't want to take any water if we can help it as it means we have to find ways to store and treat it...and that costs a lot of money. One of Arrow's key business drivers is to reduce the water/gas ratio and of course the company recognises it's an important resource to landholders and others. Over the last couple of years Arrow has halved its ratio of water to gas compared with some years ago. The company is only young and is looking at innovative solutions; its objective is to end up in the same net groundwater position in this area.

In relation to the second part of your question about the financial security of Arrow Energy, its joint owners Shell and PetroChina are very large, financially conservative organisations which have been in existence for a very long time and continue to be there financially for Arrow Energy. You all know the Shell organisation; PetroChina is one of the world's largest commercial entities with 1.6 million employees. Both are going to be around for a very long time. However, regardless of who owns Arrow Energy its legislative obligations continue in perpetuity even after its tenures are finished.

There are two aspects to the water solution. Modelling tells us what is happening; this will be checked over time with a continuous monitoring program to ensure things are happening as predicted. If there is a negative impact it then gives us time to respond appropriately.

**5. The resources sector requires skilled staff. Is Arrow Energy prepared to consider upskilling of farmers?**

Arrow already does this. The company has a deliberate policy of hiring locally in Dalby and there are obvious benefits if we can get that right. We have a strong relationship with the high schools in Dalby for Years 10-12 as well as with TAFE. The latter provides entry level skills to new recruits coming in from other industries.

**6. Who do you class as locals? Four people have just moved into my street and are already working at Arrow. The local power station considers someone who has only moved into town a week ago to be local?**

We certainly aren't trying to do anything dodgy in this regard. Some people may move to town after getting a job with Arrow; it doesn't mean that we don't try to hire long-term locals where we can. In Dalby 75% of staff live locally; some of those may have elected to come from elsewhere and become part of the local community but others are long-term local residents or have been living on properties in the district. Usually drillers, geologists and other specialists move with their rigs constantly.

**7. Can we get a copy of the presentation?**

I understand it's going onto the website; if you have difficulty accessing that we can post a hardcopy to you.

**8. I have a bore on the Condamine Alluvium. If I lose ten metres of water and my bore runs dry, what is going to happen?**

There is a legislative requirement that Arrow Energy must abide by the *Underground Water Impact Report* which identifies who will be affected in the next three years.

What we showed you earlier re the modelling was an indicative water profile only. That is not the end point. When we have all the results from the model a lot more information will be provided.

**9. When will that be available?**

The current plan is to come back with the additional information in September/October.

One issue that keeps coming up is the Great Artesian Basin (GAB). It is a massive water storage reservoir as this map shows. Some sections of the media say that the CSG industry will destroy it and yet the whole CSG area represents an incredibly small part of the Basin.

We are absolutely aware that we have to look after the aquifers and important layers containing water.

The modelling framework looks at what the available drawdown is and will come back with the data to better estimate what the effects will be. We can compare the predicted impacts with the actual impacts.

**10. Where we are situated is sub-artesian isn't it, we're not a part of the GAB?**

The Surat Basin is in fact part of the GAB. The coal seams here form part of the GAB although you are not that far from its boundary.

**11. Just going back to water, will you use in one day what irrigators on the Darling Downs use over a year?**

That is not factually correct. The amount of water we will take is substantially less than the current irrigation allocations and demand. We also believe that it is why substitution of allocations will work, there is demand for it and substitution would mean that we can get as close to a net zero groundwater position as possible.

What Arrow is trying to get across is the resilience of the system, not that its activities will not have an impact. Most of you are aware that as soon as the free flowing bores were capped some years ago by landholders and government, the sub-artesian bores began flowing again.

**Goondiwindi Community Information Session**

Date:	28 May 2011	
Venue:	Goondiwindi-Waggamba Community Cultural Centre	
Facilitator:	Jan Taylor, Principal	JTA Australia
Presenters:	Tony Knight, Vice President Exploration	Arrow Energy
	St John Herbert, Groundwater Modelling Coordinator	Arrow Energy
Other speakers:	Tobias Burwood, Production Superintendent, Dalby	Arrow Energy

**1. What is the tenure on your wells?**

The life of the wells is usually ten to twenty years. There will be upfront payments and then ongoing annual payments. The access agreements will stipulate the relationship and the lease as such. Production wells, which have a ten to twenty year life, can only be drilled under the authority of a Petroleum Lease, which in itself has a life of thirty years.

**2. Do you own the land?**

No it is private property so we need to negotiate agreements with each landholder whose land we would like to use.

**3. With regard to bore pressure will there be ongoing assessment?**

Arrow collects data on water quality, pressure etc. initially so it can track changes over time. All agreements must include 'make good' information so if there is any change to pressure, quality, and capacity the initial data is already known. A groundwater monitoring program will be ongoing for the life of the project. Some bores will have constant monitors installed; some require regular visits, perhaps on a quarterly basis

**4. Shouldn't landowners do their own monitoring so it's independent?**

There's nothing to stop landholders from doing so but Arrow is legally required to do ongoing monitoring. The minimum requirement for baseline assessments is within two kilometres of any activity. Landholders will be involved throughout the process and Arrow is required to feed back all information to them.

**5. Would you consider deepening bores for landholders? Blue Energy had different sized casing which wasn't consistent with our casing.**

If your bores are affected our 'make good' provisions protect you as Arrow is responsible for ensuring adequate water supply. Our practice is not to convert exploration wells to water bores because they are drilled for two different purposes.

**6. As a small business owner I'm interested to know if things have improved in Dalby in terms of local business activity.**

There has been a huge expansion in Dalby. For example, there are three new motels and an influx of pupils to local schools; local shops and businesses are doing good trade and there is generally more employment and money in town.

Arrow's focus is to train local people and use local suppliers. You can expect massive and quite measurable change should resource development come to your region. Arrow is committed to supporting local businesses wherever it can.

**7. Have rents gone up in Dalby?**

Yes.

**8. I might have a future business development idea for my land. Will you compensate me if I cannot continue with any future development plans? If I plan to subdivide my land and build other houses on it in ten years will you compensate me if I am unable to do that?**

We would need to have a discussion about compensation. If there is a plan in place for that to happen we would need to consider it as part of our negotiation.

**9. We all know who Shell is but what is CNPC?**

CNPC, or PetroChina, is listed on the New York and Chinese stock exchanges but majority ownership is held by the Chinese government. It is one of the biggest companies in the world with over 1.6 million employees and it has been in existence for more than a hundred years. I know there are issues for some people in relation to foreign ownership but these large companies bring the capital needed to develop these projects. Both Shell and PetroChina have that capacity.

**10. Will Arrow pay rates to the Goondiwindi Regional Council (GRC)?**

Petroleum Leases are rateable so we do pay rates to council. In relation to roads, there is a requirement in the Petroleum Act that when traffic reaches a certain level (10,000 tonnes ) Arrow will need to enter into an agreement with council to partner with it. Arrow will do that voluntarily.

**11. To the best of my knowledge, council still has not heard from Arrow. GRC found about use of Tenomby road three weeks ago. There should be a duty of care that information is provided to councils early. It is important to council so that it can plan its maintenance program properly.**

Arrow has been meeting regularly with the Western Downs and Toowoomba Regional Councils to keep them updated. We will certainly do the same for the GRC and I will follow up on that.

**12. The well at Daandine that blew out on Sunday (22 May), what is happening with it? Is it out altogether, is it damaged?**

The well is now fine, there is nothing wrong with it and it is still a viable well. The only thing we needed to do was stem the flow of gas, which we did by flooding it with water. It is now totally fine to use as a normal production well.

**13. If Arrow discovers sufficient reserves is there a production plan in a two, five or ten year period. There are other companies with potential pipelines; if they want to pipe through your areas, do they liaise with you?**

That will depend on the exploration results. We've already done a lot of work across the region and are exploring the southern portion. There is already enough gas there to underpin our operations and to support the project. Assuming that Arrow goes to a final investment decision (FID) the map shows where it will initially work. You can see that the area down in Goondiwindi is very pale and there is probably going to be no development here for another 15-20 years by the latest projections. Once we get more detail that will determine how hard we push into here. It's a process over time.

There are other players who might have acreage here, and if they cross our tenements, they will talk to us, but there will be no formal relationship with them.

**14. What's the tenure on Arrow's well heads?**

A production well can be 10-20 years. Compensation will be for the life of it, from the day we drill it to the day we plug and abandon it.

**Comment: the Mayor has asked me to raise with Arrow Energy the need to keep council informed of any activity in the area. Although you may only be at the exploration stage within the GRC area it is essential that council be advised if there is going to be unusual activity on particular roads. It is pointless for it to spend money on a maintenance program in areas where companies like Arrow Energy will be potentially damaging roads during an exploration program. If council knows beforehand it can defer maintenance work in some areas until after the company has done its work and made any repairs necessary. Limited council dollars can then be put to better use elsewhere.**

**15. This was raised at Arrow's last community information session in November and the company promised it would liaise with council on future exploration timelines. This has not occurred.**

Arrow undertakes to make contact with the Mayor and his council officers in the next month or so to discuss this issue further.